

ULTRA-THIN SILICON-ON-INSULATOR AND STRAINED-SILICON-DIRECT-ON-
INSULATOR WITH HYBRID CRYSTAL ORIENTATIONS

ABSTRACT OF THE DISCLOSURE

The invention provides integrated semiconductor devices that are formed upon an SOI substrate having different crystal orientations that provide optimal performance for a specific device. Specifically, an integrated semiconductor structure including at least an SOI substrate having a top semiconductor layer of a first crystallographic orientation and a semiconductor material of a second crystallographic orientation, wherein the semiconductor material is substantially coplanar and of substantially the same thickness as that of the top semiconductor layer and the first crystallographic orientation is different from the second crystallographic orientation is provided. The SOI substrate is formed by forming an opening into a structure that includes at least a first semiconductor layer and a second semiconductor layer that have different crystal orientations. The opening extends to the first semiconductor layer. A semiconductor material is epitaxial grown in the opening and then various etching and etch back processing steps are used in forming the SOI substrate.